Porosity Prediction for Gullfaks Field with Adaptive Neuro Fuzzy Inference System

by

Joel Lim Min Sheu
14929

Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Engineering (Hons)
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CERTIFICATION OF APPROVAL

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Approved by,

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(Dr Sia Chee Wee)

UNIVERSITI TEKNOLOGI PETRONAS

BANDAR SERI ISKANDAR, PERAK

January 2015

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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JOEL LIM MIN SHEU

ABSTRACT

Petrophysical properties such as porosity and permeability are critical in reservoir characterization. However obtaining these properties from core data is sometimes too costly for oil companies. Therefore prediction of petrophysical properties from well logs is sometimes more preferable method as it is cheaper. However, uncertainties will be present during predictions and may affect the predicted results. In this project, an artificial intelligence (AI) method known as Adaptive Neuro-Fuzzy Inference System (ANFIS) is used in predicting one of the petrophysical properties - porosity. ANFIS is the combination of other two AI namely Artificial Neural Network and Fuzzy Inference System. The main objective is to prove that ANFIS is the best prediction technique as compared with the conventional model. The project uses well logs data from Gullfaks Field as the input data for ANFIS and data of core plugs from the same field as the output data. By comparing with the conventional method - Monte Carlo method, the ANFIS model yielded a higher correlation coefficient and lower root mean squared error, confirming that ANFIS predicting ability is more accurate than that of conventional method.

ACKNOWLEDGEMENT

First of all I would like to express my heartfelt gratitude to my Final Year Project (FYP) supervisor, Dr. Sia Chee Wee for his continuous guidance and support throughout my progress in completing my report.

Next, I would like to thank the Petroleum Engineering Department of Universiti Teknologi PETRONAS for providing me a platform to practice my petroleum related artificial intelligence skills in my FYP. Through my progress I have thoroughly enhanced the aforementioned skills too.

Special thanks to my friends Ahmad Mohamad Essam Aly Rafaat and Tang Quoc Thai who have shared their knowledge and provided me technical assistance. It is indeed their unselfish character that has given me a huge boost towards the completion of my FYP.

ABBREVIATIONS AND NOMENCLATURES

Abbreviations

ANFIS	= Adaptive Neuro Fuzzy Inference System
ANN	= Artificial Neural Network
FIS	= Fuzzy Inference System

Nomenclatures

R^2	= Coefficient correlation factor
Y_i	= Y value at ith sample
Y_{mean}	= Mean value of all Y
$Y_{\lambda i}$	= Root mean squared deviation of the predicted values samples
ϕ	= Porosity
ρ_{b}	= Formation bulk density
ρ_{f}	= Density of fluid saturating the rock surrounding the borehole
ρ_{ma}	= Matrix density
Δt	= Acoustic transit time
Δt_{f}	= Acoustic transit time of the interstitial fluids
Δt_{ma}	= Acoustic transit time of the rock matrix

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Characterization of petroleum reservoir is an essential part of volumetric and reservoir modeling development and operational decision-making. Various reservoir properties or petrophysical deliverables can be described quantitatively by reservoir characterization, using the available field well logs. Among the basic petrophysical properties include permeability, porosity, water saturation and net reservoir (Lim & Kim, 2004).

In estimating these properties, well logs, well tests and core plug data analysis are among the commonly used method. Core plug data is generally considered as the best means in petrophysical properties estimation. However, due to higher operational costs, not all wells are cored. In that case, estimations based on well logs with comparison with available core data are normally utilised because the method is less expensive (Aïfa *et al*., 2014).

While making predictions, uncertainties are usually encountered. These uncertainties can in some ways affect the desired output, which in this case is the petrophysical properties predicted, including porosity, permeability and water saturation.

This work will make a case study of the Gullfaks Field, which real wireline logs are extracted and provided from the field itself.

1.2 Problem Statement

During the estimations of petrophysical properties, petrophysical uncertainties which are not taken into account could ultimately affect volume in place estimation. In actual world, the petrophysical properties are usually provided without quantitatively determining their uncertainties. (Fylling, 2002) The factors contributing to the petrophysical uncertainties include:

- Uncertainties related to measurement condition and measurement itself
- Uncertainties related to model and parameter
- Uncertainties related to log limitations

1.3 Objectives and Scope of Study

The objectives of this project include:

- To prove that ANFIS is more effective in creating predicting model that the conventional methods.
- To achieve the highest correlation coefficient and least possible root mean square error.

1.4 Relevancy and Feasibility

Since the project involves prediction of petrophysical properties, which is crucial in reservoir characterization, therefore the project has high relevancy to petroleum engineering course. Using MATLAB to train, test and validating log data provided until desirable results are obtained will not take more than a semester to complete, therefore the project is highly feasible.

CHAPTER 2

LITERATURE REVIEW

Over the past decade, application of artificial intelligence in various fields, particularly engineering problems are steadily increasing (Kar *et al.*, 2014). Neuro networks and fuzzy logic are among two of the artificial intelligence. The idea of Adaptive Neuro-Fuzzy Inference System (ANFIS) is proposed by Jang (1993), which refers to the combination of fuzzy logic and artificial neural network (ANN).

A survey on the usage of Neuro-Fuzzy System (NFS) and its methodology development over various fields from 2002 to 2012 is made by Kar *et al.* (2014). The survey discovered that the NFS was used in large number of fields, including medical system, traffic control, economic system, student modeling, and in the case of this paper, forecasting and prediction. It is concluded that it is the learning ability and the ability to change continually that lead to the huge increase in NFS application.

In the petroleum industry, particularly in the field of petrophysics, ANN and fuzzy logic are commonly used for predictions of petrophysical properties including permeability, porosity and water saturation, and also for quantifying petrophysical uncertainties. Several success applications in permeability prediction from well log data have been proven using ANN (Aminzadeh *et al.*, 1999; Tahmasebi & Hezarkhani, 2012). Nevertheless, the fuzzy logic model has also been used numerous times and achieve satisfactory results in predicting permeability in porous media (Abdulraheem *et al.*, 2007; Kadkhodaie *et al.*, 2006; Kaydani *et al.*, 2014).

There is a study by Noorani *et al.* (2009) in proving the Neuro-fuzzy system as an accurate prediction tool by using it to predict rocks' uniaxial compressive strength. In this study, 126 rock data sets are collected and are split into training data set (100 sets) and testing data set (26 sets). The prediction performance of neuro-fuzzy system is compared to the multiple regression model. The results is that the neuro-fuzzy system has a lower root mean squared error than that of multiple regression model, which is 13.65 compared to 15.60.

Besides that, Jafari *et al.* (2012) estimated fracture density using ANFIS. Comparing the measured results from given well logs and the estimation from ANFIS, it found that the results yield excellent agreement, having a correlation coefficient as high as 98%.

In the part of petrophysical uncertainties quantification, several different models have been carried out, including the Monte-Carlo modeling utilised by Adams (2005). However, the disadvantage of Monte-Carlo method is that huge number of cycles (>50) are usually required for a higher validity statistics to be developed. First order error propagation method is also proposed by Fylling (2002), where the method is analytical and is based on several assumptions. However for the approximation derived by this method to be strictly valid, each uncertainties is required to be normally distributed and symmetrical.

To show that ANFIS is a reliable method in quantifying uncertainties, a study by Atmaca *et al.* (2001) predicted automobile fuel consumption in the unit of miles per gallon using three methods: Artificial Neural Network, Fuzzy Inference System and Adaptive Neuro-Fuzzy System. All methods are done in MATLAB. The result is then compared between all three methods. The conclusion is that ANFIS not only have shorter learning duration than ANN, implying it reaches target faster than ANN; it also obtained the least average error in trained data among the three methods.

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

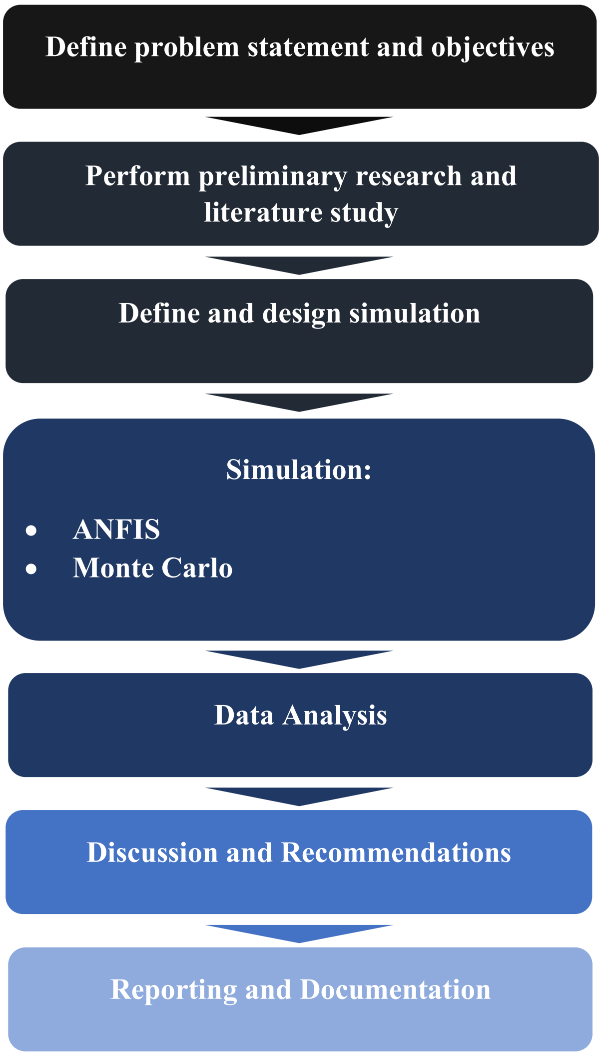

Figure 3.1: Research Methodology

3.1.1 Adaptive Neuro Fuzzy Inference System (ANFIS)

ANFIS provides a means for fuzzy modeling procedure with the aim to learn information from a given data set (Aïfa *et al.*, 2014). The steps for modeling approach utilised by ANFIS are shown as below:

- A parameterized model structure is hypothesized.
- The Input/output data is collected in the form that can be used by ANFIS for training.
- The Fuzzy Inference System model is then trained to emulate the training data given to it. This is done based on the chosen error criterion, the membership function parameters is modified.

The correlation factor is obtained from the below formula:

$$R^2 = \frac{\sum (Y_i - Y_{\text{mean}})^2 - \sum (Y_i - Y_{\lambda i})^2}{(Y_i - Y_{\text{mean}})^2} \quad \text{………………………….…………..(Equation 1)}$$

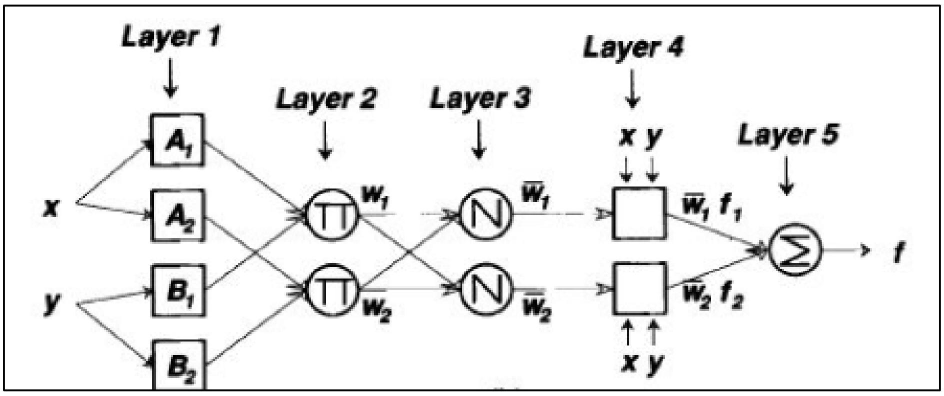

Figure 3.1.1: An ANFIS Structure (Jang, 2003)

3.1.2 Artificial Neural Network (ANN)

The architecture of adaptive network is a superset of feed forward neural networks with the capability of learning with supervision. It is a type of artificial network structure based on human neural network node, and thus consists of directional links and nodes which are connected (Denai *et al*., 2004).

Its most notable feature is the adaptive capability of the nodes, which means the outputs are dependent on parameters pertaining to those nodes. Those parameters can be specified by the learning rule on how it should be changed to reduce the prescribed error measure.

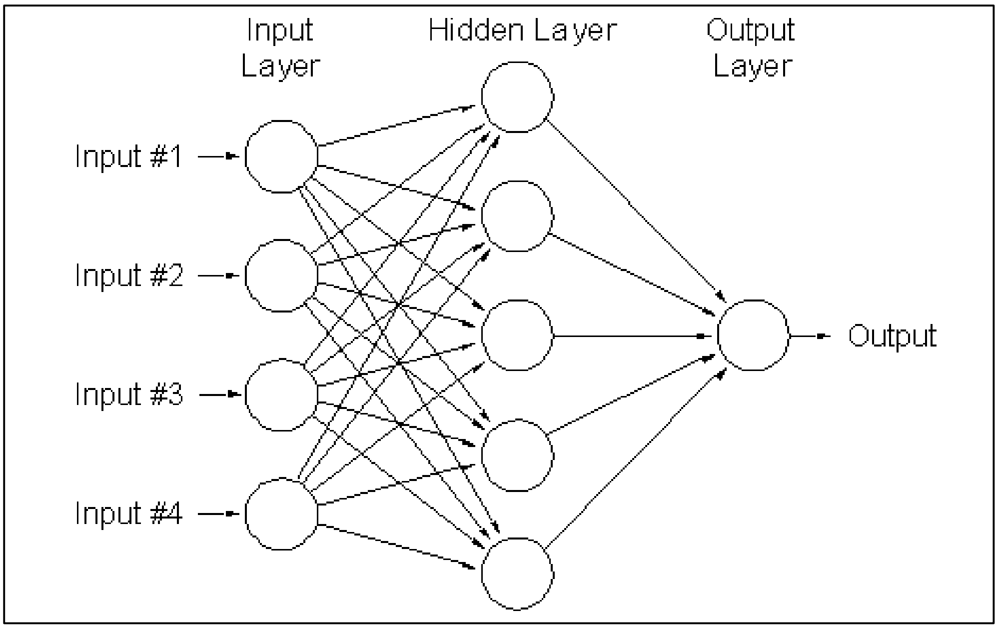

Figure 3.1.2: A Multilayer Neural Network (Jang, 1993)

3.1.3 Fuzzy Inference System

Fuzzy inference system consists of five functional blocks (Jang, 1993):

- A rule base consisting a number of sets of fuzzy if-then rules.
- A database which membership of fuzzy sets used in fuzzy rules is defined.
- A decision-making unit where inference operations on the set rules can be performed.
- A fuzzification interface where crisps inputs can be transformed to linguistics values.
- A defuzzfication interface where fuzzy results obtained from the inference can be transformed into crisp outputs.

Fuzzy reasoning can be performed by the fuzzy inference system with the following steps:

- Fuzzification: Input variables are compared to membership functions in order to obtain membership values of each label.
- Membership values which are on the premise part are combined to obtain weight (firing strength) of each rule.
- Qualified consequent of each rule is generated depending on the obtained weight.
- Defuzzification: Qualified consequents are aggregated to obtain a crisp output.

3.2 Project Activities

In the process of completing this project, the following software have been used:

- MATLAB
- Microsoft ® Excel
- Microsoft ® Visual Studio

In order to obtain lowest possible root mean squared error, there are several significant project activities to be done. First of all, well logs and core plugs data are obtained from the Gullfaks Field. Next, the input and output data for ANFIS are decided. The inputs are the types of well logs which are specifically chosen for predicting specific petrophysical quantities. For instance, density log, neutron porosity log and sonic log are chosen for predicting porosity. The output to ANFIS is the petrophysical data from core plugs.

Then, from the chosen log data, the data distribution ratio between training, testing and validating is determined. After the distribution ratio is determined, certain amount of data sets are used for training and testing. Optimization of ANFIS model may be done during data training. The trained ANFIS is finally validated by validating data sets. After validation, the ANFIS model will be compared with conventional methods. The performance comparison can be done by comparing correlation coefficient, root mean squared error and mean absolute error.

Two methods have been used to construct an ANFIS model respectively and comparing the error obtained from training data and the testing data obtained from testing data. Before starting with ANFIS model, as many as 129 list of well logs data from the Gullfaks Field are obtained for the use of this project. The well logs data consist of more than 300,000 rows of data, which is more than sufficient to train, test and validate data.

After the well logs data are obtained, a C++ code is constructed to sort the well logs file (.las) into defined columns and rows, which will make sorting data in Microsoft Excel much easier. Currently, it is decided to first build a model on predicting porosity.

Therefore, only the logs which are essential for determining porosity are used, for example acoustic logs, neutron porosity logs and density logs. These logs are used as the input for ANFIS model. As for the output, the core porosity data is inserted at the right end of the column.

The types of well logs chosen as input are essential in determining porosity. For acoustic log, it is effective in evaluating porosity because of the compressional velocity of sound which travels slower in fluid than in rocks. A fluid-filled pore space will cause the acoustic energy to take longer to travel from transmitter to receiver, and that also means high porosity. Therefore, it can be deduced that the time taken to travel in rock matrix is affected by the variations in lithology and confining pore pressure. The formula below shows the relationship of porosity and acoustic transit time:

$$\phi = \frac{\Delta t - \Delta t_{\mathrm{ma}}}{\Delta t_{\mathrm{f}} - \Delta t_{\mathrm{ma}}} \quad \text{(Equation 2)}$$

For density log, its logging tool measures the formation electron density by emitting gamma ray to formation from a radioactive source. The emitted gamma ray would form collision with electrons in the formation and scatter, this phenomena is called Compton Scattering. The number of returning gamma rays are counted by a detector located at a fixed distance from the emitting source. As a result, the number of returning gamma ray indicates the formation bulk density, which is a function of porosity, matrix density and fluids contained in pore spaces. Therefore, porosity can be calculated utilizing bulk density by the following formula:

$$\phi = \frac{\rho_{\mathrm{ma}} - \rho_{\mathrm{b}}}{\rho_{\mathrm{ma}} - \rho_{\mathrm{f}}} \quad \text{(Equation 3)}$$

Nonetheless, for the neutron porosity log, its logging tool measures the hydrogen concentration in the formation by emitting neutrons from a neutron source. The emitted neutrons will collide with the nuclei of the rock formation and lose partial of the energy. When the emitted neutrons collide with the hydrogen atoms, maximum energy loss occurs. This is due to both neutron and hydrogen are having the same mass, and therefore it can be concluded that most neutron energy loss occurs in area which has the highest concentration of hydrogen. The neutron energy loss is related to porosity due to hydrogen which is concentrated in the fluid filling the pores in porous formations.

For creating the ANFIS model, the ‘Neuro-Fuzzy Design’ application which can be found in MATLAB is used, or one can simply type in ‘anfisedit’ in MATLAB for the application to appear. Firstly, the training process is carried out. 70 percent of the data are used for training the model. When generating the Fuzzy Inference System, *gaussmf* is chosen as the MF type for the input. For output, the MF type is chosen to be constant.

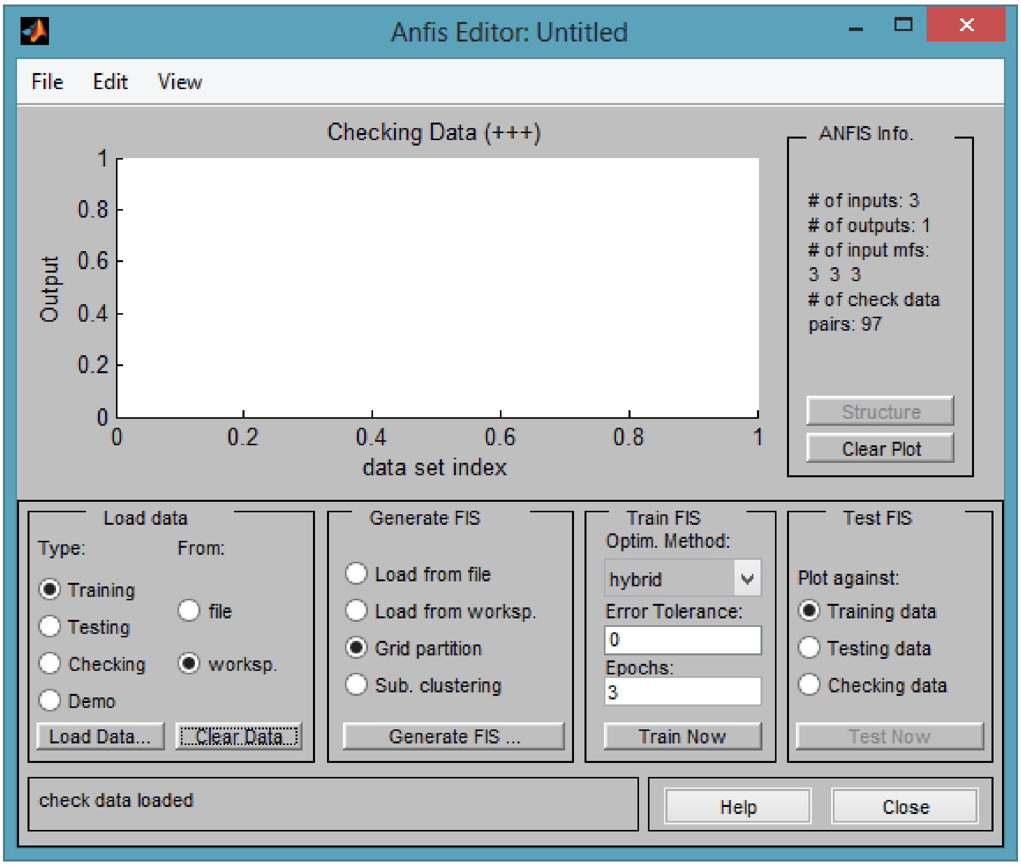

Figure 3.2.1: The ANFIS Editor in MATLAB

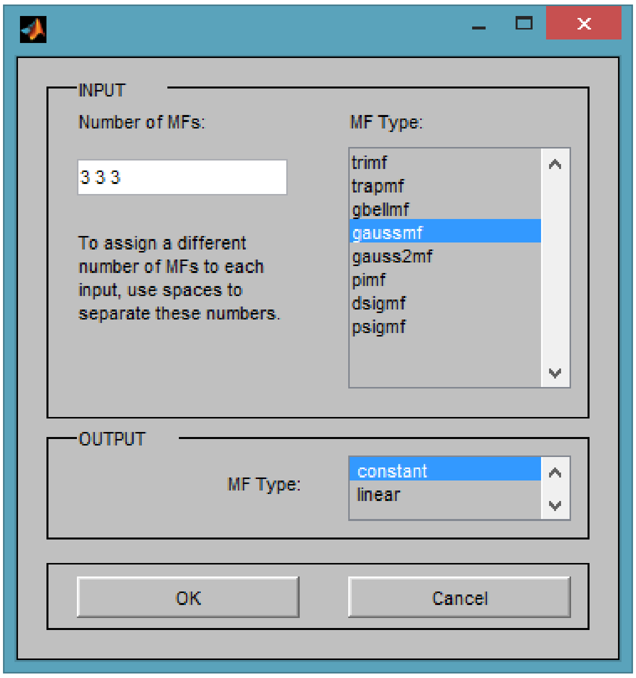

Figure 3.2.2: Generating the Fuzzy Inference System

For training the Fuzzy Inference System, the optimization method used is hybrid, while epochs is set to three. The training of the Fuzzy Inference System generates the ANFIS model as below:

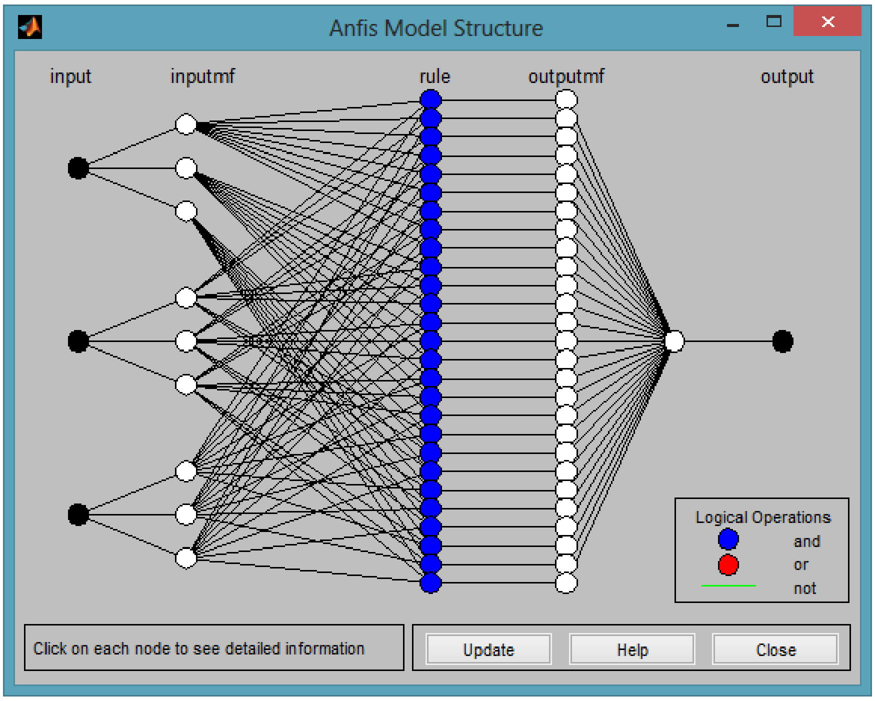

Figure 3.2.3: ANFIS Model Structure in Training Process

As portrayed in Figure 3.2.3, the model starts with the three input which are sonic log, neutron porosity log and bulk density log. Each of the input will go through three inputmf as set previously. Then these inputmf and outputmf and output given, as in this case, the core porosity, will generate the rules which will finally define the model.

3.2.1 Data Preparation

Overall, a total of three wells data are being used in this project, which are:

1. 341001
2. 3410a11
3. 3410c14

Of all these three wells, a total of 831 data sets are being extracted and used for this project. The mean, minimum, maximum and standard deviation are calculated for each well's data.

Table 1: Statistics descriptions of input and output data set for well 341001

	GR	DT	NPHI	RHOB	PORC
Min	18.1006	76.378	1.2711	1.5183	0.018
Max	83.6	165.95	1671.5	192.789	0.365
Mean	46.46895	121.008	132.3887	29.22553	0.288719
Standard Deviation	12.5048	12.53833	293.8835	36.63271	0.077382

Table 2: Statistics descriptions of input and output data set for well 3410a11

	GR	DT	NPHI	RHOB	PORC
Min	22.21	88.5146	0.2832	1.3211	0.005
Max	120	168.8	0.7221	2.9601	0.389
Mean	48.44373	124.3257	0.398969	2.117033	0.281908
Standard Deviation	15.89389	9.698464	0.067986	0.175093	0.076614

Table 3: Statistics descriptions of input and output data set for well 3410c14

	GR	DT	NPHI	RHOB	PORC
Min	21.1591	64.2009	0.424	0.459	0.044
Max	119.6752	130.6993	1950	1950	0.356
Mean	50.50161	110.4649	21.97585	64.81625	0.237364
Standard Deviation	18.78004	12.3726	152.834	302.709	0.070913

Table 4: Overall statistics descriptions of input and output data set for all wells

	GR	DT	NPHI	RHOB	PORC
Min	18.1006	64.2009	0.2832	0.459	0.005
Max	120	168.8	1950	1950	0.389
Mean	48.76406	118.1036	41.10358	33.22254	0.266186
Standard Deviation	16.4333	13.08578	181.48	191.7738	0.078077

3.3 Key Milestones

Table 5: Key Milestones

Milestones	Date
Draft Extended Proposal to Supervisor	27 Oct. 2014
Submit Extended Proposal	31 Oct. 2014
Proposal Defense	28 Nov. 2014
Data Sorting Complete	18 Feb. 2015
Simulation with ANFIS Complete	20 Mar. 2015
Optimization of Results Complete	27 Mar. 2015
Review Findings with Supervisor	1 Apr. 2015
Review Draft Final Report with Supervisor	1 Apr. 2015
Submit Dissertation and Technical Paper	Week 14 of FYP 2

3.4 Gantt Chart

Table 6: Gantt Chart of Final Year Project I

Week Number / Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Topic selection														
Research and case studies														
Literature review on ANFIS and its application														
Submission of Extended Proposal														
Preparation and Presentation for Proposal Defense														
Obtaining well logs data and core plug data														
Changes focus on porosity as the petrophysical property to be predicted														
Submission of Interim Draft Report														
Submission of Interim Report														

Table 7: Gantt Chart of Final Year Project II

Week Number / Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project work resumes – ANFIS Simulation															
Submission of Progress Report															
Project work resumes – ANFIS Simulation															
Pre-SEDEX															
Submission of Draft Report															
Submission of Project Dissertation (Soft Bounded)															
Submission of Technical Paper															
Viva															
Submission of Project Dissertation (Hard Bounded)															

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Root Mean Squared Error

The main aim of this project is to prove that ANFIS model is the best prediction technique in comparison with other conventional model. The expected results from the ANFIS model includes accurate training data, decreasing Root Mean Squared Error (RMSE) with number of epochs and ultimately, has the highest correlation coefficient and lowest RMSE when compared with other conventional model.

By using the *gaussmf* as the membership function type and assigning three membership functions for each input, ANFIS created a set of rules for the prediction model.

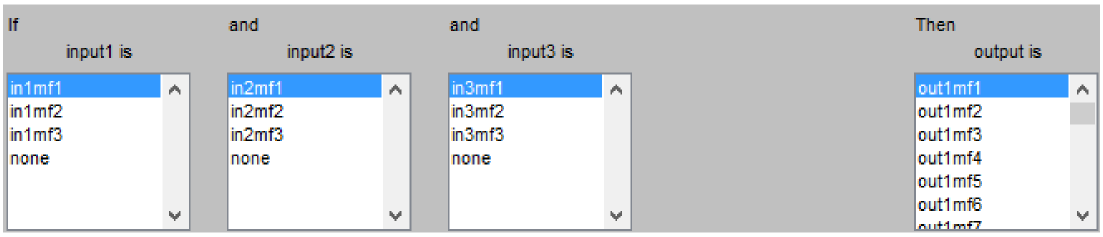

Figure 4.1.1: Relationship between each input and the targeted output

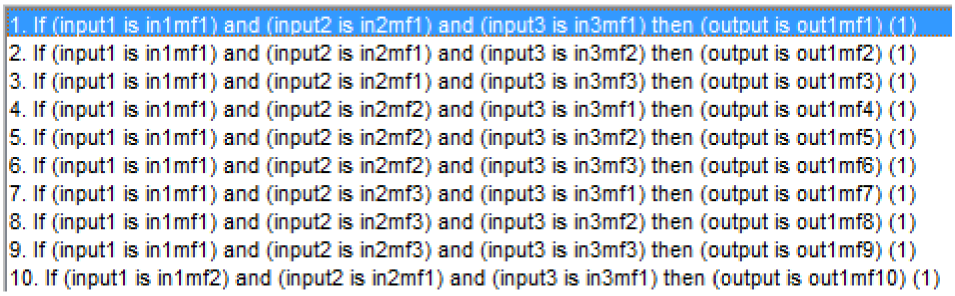
1. If (input1 is in1mf1) and (input2 is in2mf1) and (input3 is in3mf1) then (output is out1mf1) (1)
2. If (input1 is in1mf1) and (input2 is in2mf1) and (input3 is in3mf2) then (output is out1mf2) (1)
3. If (input1 is in1mf1) and (input2 is in2mf1) and (input3 is in3mf3) then (output is out1mf3) (1)
4. If (input1 is in1mf1) and (input2 is in2mf2) and (input3 is in3mf1) then (output is out1mf4) (1)
5. If (input1 is in1mf1) and (input2 is in2mf2) and (input3 is in3mf2) then (output is out1mf5) (1)
6. If (input1 is in1mf1) and (input2 is in2mf2) and (input3 is in3mf3) then (output is out1mf6) (1)
7. If (input1 is in1mf1) and (input2 is in2mf3) and (input3 is in3mf1) then (output is out1mf7) (1)
8. If (input1 is in1mf1) and (input2 is in2mf3) and (input3 is in3mf2) then (output is out1mf8) (1)
9. If (input1 is in1mf1) and (input2 is in2mf3) and (input3 is in3mf3) then (output is out1mf9) (1)
10. If (input1 is in1mf2) and (input2 is in2mf1) and (input3 is in3mf1) then (output is out1mf10) (1)

Figure 4.1.2: Rules created after number of membership functions for each inputs

After defining the membership functions, the fuzzy inference system (FIS) is generated and the simulation can then be started. During simulation, 30 epochs is set for each round of simulation. This is to reduce the epoch error occurred during simulation. There are three figure below indicating the error decreases with epochs.

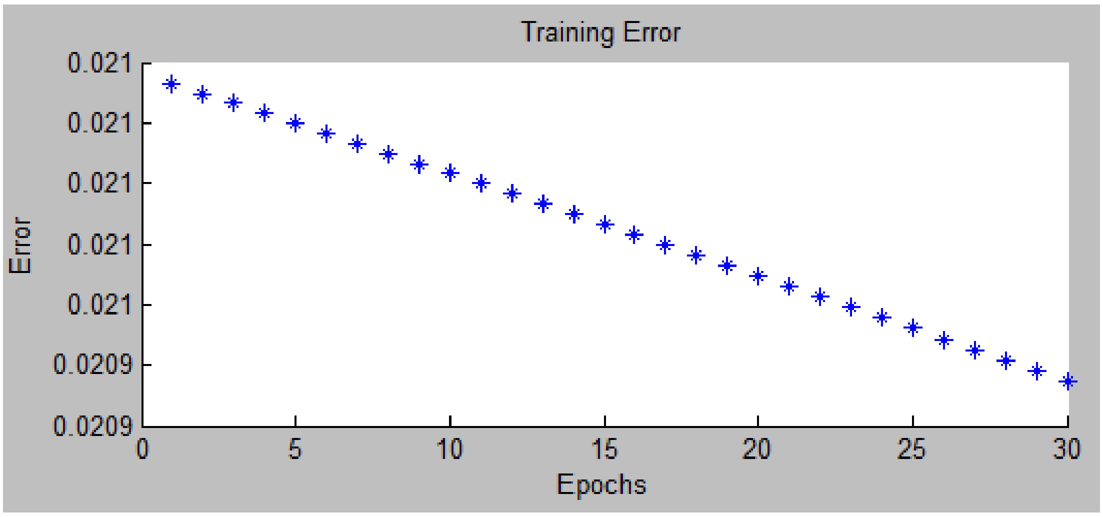

Figure 4.1.3: Error vs Epoch for well 341001

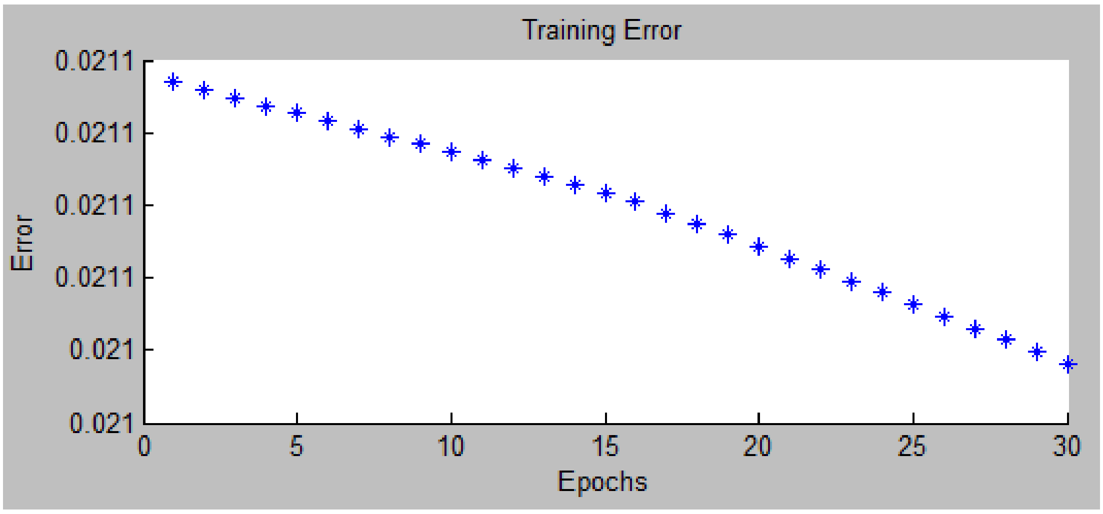

Figure 4.1.4: Error vs Epoch for well 3410a11

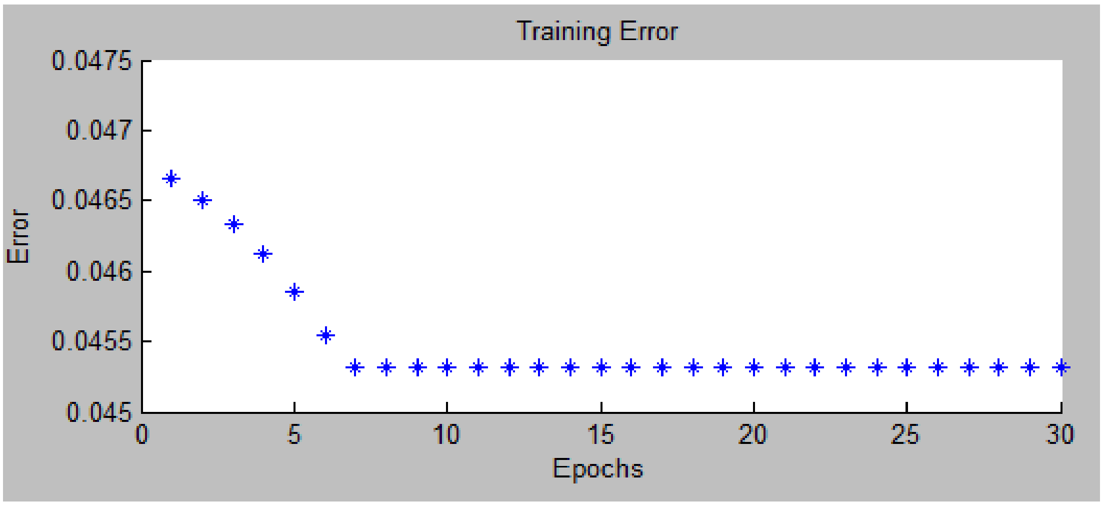

Figure 4.1.5: Error vs Epoch for well 3410c14

Based on the three error vs epoch graph, it can be seen that the error steadily decreases with epochs for well 341001 and well 3410a11, while for well 3410c14, the error stopped decreasing after seven epochs. These graphs show the efficiency of ANFIS in prediction, improving its accuracy after each epoch. It can also be concluded that it is not necessary to set too many epochs cycle in the simulation, because the reduction in error will stop at some point. Too many epochs cycle will take more time for simulation to complete, and sometimes crashing the computer.

The data sets are separated into Training, Checking, and Testing, where 70% of data are used for training, 15% are used for checking and the remaining 15% are used for testing. After simulation, the actual vs prediction graphs are plotted for each well. This is to show if the ANFIS can predict porosity close to targeted core porosity.

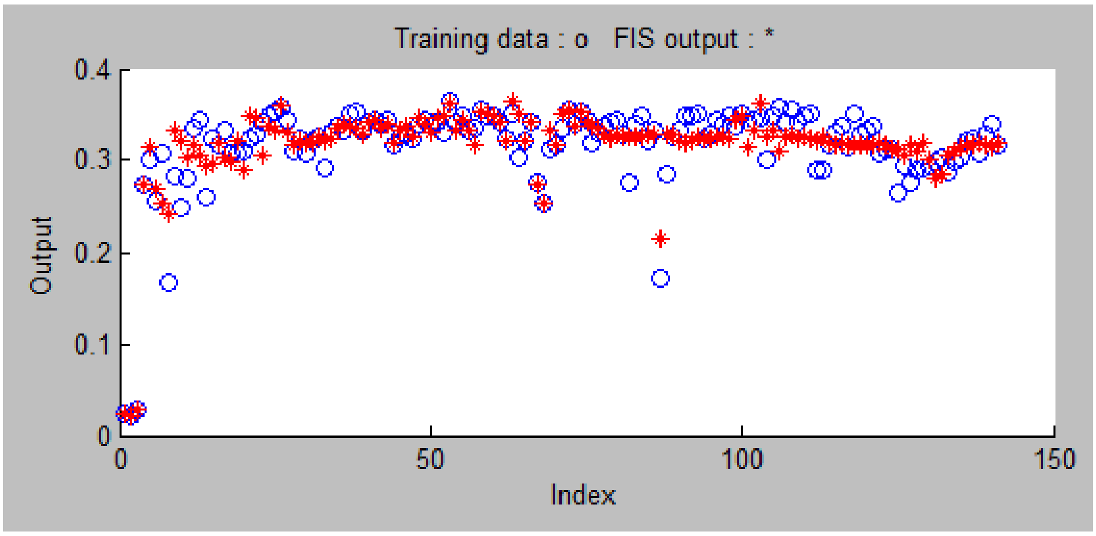

Figure 4.1.6: Actual vs Target Prediction for Well 341001

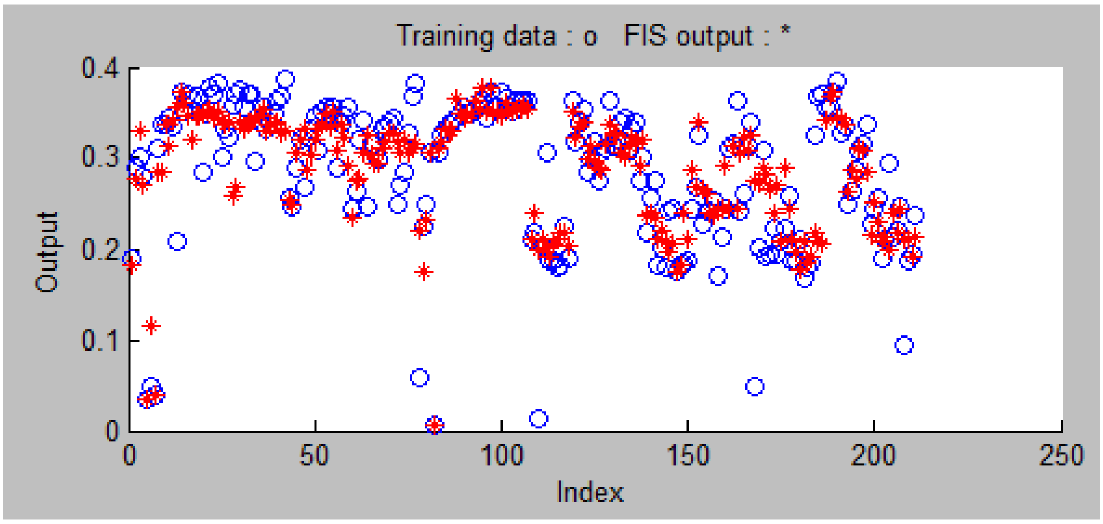

Figure 4.1.7: Actual vs Target Prediction for Well 3410a11

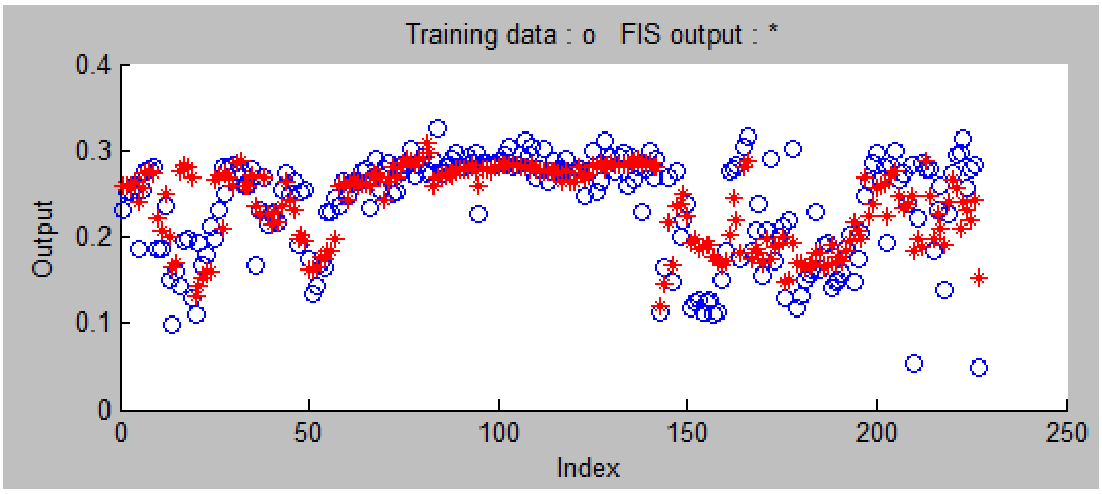

Figure 4.1.8: Actual vs Target Prediction for Well 3410c14

Based on the actual vs target graphs, the blue circles are the plots of core porosity, while the red crosses are the plots of predicted porosity by ANFIS. It can be seen for all three graphs, the prediction is very accurate when compared with the targeted output which is core porosity. These graphs indicate that the prediction model generated by ANFIS is accurate. The accuracy can be further confirmed by examining the Root Mean Square Error (RMSE) generated by each prediction.

Table 8: Epoch Error and Root Mean Square Error for each well

Well	Data Type	Sets of Data Used	Epoch Error	RMSE
341001	Training	143	0.021036	0.1264
	Checking	31	0.023934	0.1310
	Testing	30	0.031567	0.1339
3410a11	Training	210	0.045312	0.1511
	Checking	46	0.047812	0.1549
	Testing	46	0.049504	0.1594
3410c14	Training	227	0.068475	0.1429
	Checking	49	0.070568	0.1476
	Testing	48	0.075639	0.1523

The table above concluded the sets of data used, epoch error and RMSE for each simulation. Based on the RMSE, it can be seen that for each well simulation, the training data set always have the lowest RMSE among the three data type, while testing is always the highest. This is because in training process, ANFIS is presented with the output porosity for it to generate its prediction model, while in testing, the created prediction model is tested by comparing its predicted porosity with the target output core porosity.

Nonetheless, the RMSE for each process is low enough to prove that the ANFIS has created an accurate porosity prediction model. As shown in the table, the testing RMSE ranges from 13.39% to 15.23%.

4.2 Correlation Coefficient

It is essential to compare the effectiveness of ANFIS' predicted model with the conventional method. This time the Monte Carlo method is chosen for comparison. The Monte Carlo method is simulated in Microsoft Excel, and correlation coefficient and root mean square error are calculated when its results is compared with the target output core porosity.

The correlation factor, R^2 can be obtained using the following formula:

$$R^2 = \frac{\sum(Y_i - Y_{\text{mean}})^2 - \sum(Y_i - Y_{\lambda i})}{(Y_i - Y_{\text{mean}})^2} \qquad \text{...(Equation 3)}$$

It is essential to calculate and compare the correlation coefficient of both methods because it gives an indication on how strongly the two variables, in the case actual output and target output, are related to each other. This also represent how accurate is the used methods in their prediction models.

Table 9: Result comparison between ANFIS and Monte Carlo Method

Method	Correlation Coefficient	RMSE
ANFIS	**0.9889**	**0.1470**
Monte Carlo method	0.9675	0.1734

The final results is shown in the table above, where ANFIS has the correlation coefficient of 0.9889 and root mean square error of 0.1470, while the Monte Carlo has a correlation coefficient of 0.9675 and root mean square error of 0.1734.

Therefore it can be concluded that ANFIS is indeed a better tool in predicting porosity as compared to the conventional method – the Monte Carlo Method.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In conclusion, the combination of artificial neuro network and fuzzy logic which forms ANFIS can yield a better and improved results compared to other conventional method, in this case, Monte Carlo method when used in predicting porosity. The root mean square error for ANFIS model is lower and its correlation coefficient is higher when it is compared to that of Monte Carlo method. ANFIS has the correlation coefficient of 0.9889 and root mean square error of 0.1470, while the Monte Carlo has a correlation coefficient of 0.9675 and root mean square error of 0.1734.

5.2 Recommendation

For recommendation, it is suggested include more related well logs including gamma ray logs to further improve the prediction model because it would add more rules and provide more relation to the desired output. Nevertheless, it is recommended to test the ANFIS in predicting permeability in the future to further validate its prediction performance.

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APPENDICES

APPENDIX I: C++ code for sorting well logs data

```
#include <fstream>
#include <iostream>
#include <string>
#include <stdio.h>
using namespace std;
int main()
{
	string dir, name_file, txt;
	int inpt[23];
	int prnt[23];
	ifstream filedir;
	filedir.open("C:\\Users\\sam\\Desktop\\FDP\\logs\\dir\\dir.txt");
	while (filedir >> dir)
	{
		filedir >> name_file;
		ifstream myfile;
		myfile.open(dir);
		int validme = 0, lenth = 0, mover = 0, allow = 0, lock1 = 0,
lock2 = 0;
		txt = "";
		ofstream wrtin;
		wrtin.open("C:\\Users\\sam\\Desktop\\FDP\\logs\\output\\" +
name_file);
		while (myfile >> txt)
		{
			//cout << txt << endl;
			if (txt == "#"  && validme < 1)
			{
				validme++;
				lock1 = 1;
			}
			if (txt == "DEPT"  && validme < 2 && lock1 == 1)
			{
				validme++;
			}
			if (txt == "~A")
			{
				validme = 3;
				wrtin << endl << name_file << " ";
				allow = 1;
				continue;
			}
			if (validme == 2)
			{
				if (txt == "#")
				{
					continue;
				}
				wrtin << txt << " ";
```

```
                lenth++;
            }
            if (allow == 1)
            {
                if (mover == lenth)
                {
                    wrtin << endl << name_file<<" ";
                    mover = 0;
                }
                if (txt == "#")
                {
                    continue;
                }
                wrtin << txt << " ";
                mover++;
            }
        //cout << txt<<endl;
        }
            myfile.close();
            wrtin.close();
    }
        getchar();
        return 0;
    }
```

APPENDIX II: Well log and core data as the input and output for ANFIS

DEPTH	WELL	DT	NPHI	RHOB	PORC
1784.95	341001	129.8833	122.4696	192.789	0.024
1785.3	341001	91.613	190.48	131.8513	0.022
1785.6	341001	113.2391	352.8268	152.4159	0.028
1786.05	341001	76.378	374.4397	100.5681	0.274
1802.55	341001	145.69	17.617	8.0053	0.301
1803.15	341001	165.95	8.1939	5.0424	0.255
1803.5	341001	158.3864	5.5701	3.7617	0.308
1808.15	341001	146.2038	3.5154	4.739	0.168
1812.85	341001	130.1708	10.5937	48.2802	0.283
1814.45	341001	122.76	22.956	12.1956	0.248
1815.9	341001	133.21	11.09	4.3722	0.281
1815	341001	128.76	18.216	9.1677	0.335
1815.45	341001	131.812	15.0959	6.5972	0.345
1816.8	341001	126.2973	3.7165	2.2795	0.26
1816.4	341001	126.39	5.683	2.4837	0.325
1818.75	341001	129.4808	6.1391	96.2075	0.318
1830.84	341001	119.08	1.4321	2.1881	0.334
1835.7	341001	117.2	36.529	83.9463	0.307
1835	341001	119.8493	21.4592	59.6954	0.309

1835.35	341001	118.07	27.5075	72.8719	0.311
1836.7	341001	113	69.652	82.6881	0.324
1836	341001	115.7091	46.0265	89.0451	0.329
1836.35	341001	112.6999	59.0796	82.8617	0.343
1837.35	341001	127.9986	94.3508	59.8589	0.349
1837.7	341001	127.38	107.37	44.2485	0.354
1837.1	341001	121.99	81.412	76.7713	0.359
1838	341001	127.47	121.0827	33.4911	0.345
1839.7	341001	120.5897	58.8777	23.0063	0.31
1839	341001	125.03	66.746	30.9064	0.324
1840	341001	120.2102	58.3395	24.2017	0.307
1840.35	341001	121.8004	55.3696	29.5286	0.322
1840.7	341001	122.67	53.789	46.9559	0.327
1841	341001	121.03	54.875	56.6653	0.292
1841.35	341001	122.1195	64.4549	47.2716	0.331
1841.7	341001	125.0104	92.0767	81.9132	0.338
1842.7	341001	125.34	210.73	110.3889	0.332
1842	341001	126.17	136.27	95.6186	0.352
1842.35	341001	127.1097	198.0941	107.727	0.353
1843	341001	124.71	311.51	103.7034	0.332
1843.8	341001	126.7502	1029.105	63.8229	0.343
1843.35	341001	126.1896	1429.522	86.5895	0.344
1844.7	341001	129.67	239.09	85.3617	0.34
1844.35	341001	128.6902	251.9981	70.5393	0.344
1845.35	341001	128.13	308.9299	96.6001	0.317
1845.7	341001	129.0506	385.9216	113.87	0.327
1845	341001	129.05	230.37	91.7317	0.329
1846	341001	131.12	482.3699	105.2208	0.325
1846.55	341001	134.1419	560.9985	83.4489	0.34
1846.35	341001	133.2404	557.2218	91.3948	0.345
1847.55	341001	131.97	868.9199	74.6005	0.337
1847.95	341001	129.63	773.2397	55.3545	0.342
1848.65	341001	131.9399	370.8094	68.0343	0.331
1848.3	341001	131.3902	500.8422	57.6465	0.365
1849.75	341001	129.4605	238.6706	79.0714	0.342
1849.35	341001	127.32	233.23	67.6891	0.35
1850.5	341001	128.4791	390.6657	106.6996	0.333
1850.15	341001	130.54	329.6497	85.9194	0.335
1850.85	341001	128.73	911.1799	114.6361	0.355
1851.2	341001	129.6499	1637.279	105.5423	0.35
1852.05	341001	129.23	1671.5	70.044	0.349
1853.2	341001	129.3497	1619.504	38.0615	0.343
1854.8	341001	132.67	120.84	53.8969	0.325
1854.15	341001	130.76	279.4797	28.9065	0.351
1855.15	341001	128.1217	155.6795	50.8664	0.303
1855.85	341001	123.2691	230.8661	55.1947	0.322

1855.5	341001	124.06	180.89	47.9186	0.342
1856.5	341001	123.5899	903.4123	50.451	0.275
1857.75	341001	126.4904	82.8667	110.8245	0.254
1857.15	341001	125.7102	160.139	37.5077	0.313
1859.05	341001	125.9517	1666.335	115.6027	0.318
1865	341001	128.53	721.1396	61.9794	0.336
1865.6	341001	130.9411	414.4854	62.2845	0.355
1866.6	341001	127.89	326.3198	68.5598	0.34
1867.35	341001	130.91	347.8401	73.4518	0.353
1868.95	341001	129.3208	293.2259	49.6968	0.345
1869.8	341001	129.54	133.46	32.3364	0.32
1870.6	341001	131.11	86.694	28.2437	0.331
1871.6	341001	127.6683	63.8825	19.0607	0.338
1871	341001	122.7913	63.0505	23.7519	0.343
1871.3	341001	126.94	56.56	24.5211	0.344
1874.7	341001	125.43	36.358	15.5232	0.329
1875.7	341001	124.51	42.972	14.4041	0.275
1875.05	341001	126.7094	37.7017	15.5254	0.339
1875.35	341001	125.82	47.591	15.7063	0.349
1876.05	341001	124.8	43.389	17.2818	0.321
1876.4	341001	124.7001	42.9922	18.261	0.333
1877.35	341001	100.2322	49.0644	22.54	0.172
1877	341001	120.9328	41.4454	20.7985	0.286
1878.1	341001	126.95	75.462	16.7132	0.327
1878.45	341001	127.35	76.463	13.9613	0.332
1878.8	341001	127.3602	64.3357	13.5929	0.348
1879.15	341001	127.98	51.635	14.6885	0.349
1879.5	341001	126.4899	40.1193	16.2891	0.351
1880.65	341001	128.21	42.387	13.6989	0.325
1880	341001	125.71	42.155	13.1015	0.328
1880.35	341001	127.3796	43.502	13.0333	0.345
1881.4	341001	124.9301	34.568	15.8817	0.34
1881	341001	124.74	38.443	14.9648	0.349
1882.3	341001	120.5096	40.4236	20.1294	0.338
1882.7	341001	119.2292	45.9846	22.287	0.352
1883.4	341001	112.3271	54.4193	20.7779	0.342
1883.05	341001	116.94	53.631	19.1924	0.345
1883.95	341001	91.191	108.12	21.1502	0.346
1884.6	341001	123.05	73.592	17.8749	0.302
1884.95	341001	131.2102	83.5197	16.5286	0.349
1884.3	341001	103.1652	87.3228	19.1638	0.359
1885.65	341001	128.1902	59.3349	13.9821	0.341
1885.3	341001	129.6096	75.3429	15.0606	0.356
1886.7	341001	126.7099	48.0162	13.1577	0.343
1886	341001	128.05	54.357	13.5847	0.348
1886.35	341001	127.46	49.712	14.0168	0.351

1892.55	341001	120.23	14.551	8.0046	0.289
1892.9	341001	119.95	15.089	9.8598	0.289
1903.05	341001	125.38	18.059	9.2411	0.317
1903.75	341001	125.07	19.912	7.9279	0.331
1903.45	341001	125.0902	19.2588	8.6285	0.337
1904.1	341001	125.02	19.4856	7.4283	0.314
1904.7	341001	125.45	17.7494	7.2661	0.352
1905	341001	125.24	16.391	7.189	0.328
1905.35	341001	124.6097	15.2238	7.0336	0.334
1905.7	341001	123.68	15.045	7.1369	0.338
1906.45	341001	122.3592	14.9071	7.2037	0.307
1906.05	341001	124.16	15.0449	6.9687	0.312
1906.8	341001	118.59	15.386	7.0827	0.313
1907.6	341001	119.04	16.078	6.1266	0.264
1907.1	341001	116.05	16.082	6.5085	0.294
1908.35	341001	120.66	13.686	6.4069	0.275
1908.65	341001	118.5889	12.8908	6.1299	0.289
1908	341001	121.4413	14.9774	5.9542	0.293
1909	341001	115.55	12.524	6.0121	0.295
1909.8	341001	109.9	11.946	6.2489	0.299
1909.3	341001	110.4564	11.7569	6.295	0.303
1910.4	341001	155.06	12.184	6.0759	0.288
1910.1	341001	142.0628	12.512	6.1208	0.299
1911	341001	136.27	13.327	5.7137	0.304
1911.65	341001	125.98	12.333	5.6316	0.322
1911.3	341001	130.0589	13.1288	5.3986	0.323
1912.4	341001	122.2193	11	5.9801	0.307
1912	341001	125.6793	11.3758	6.0855	0.329
1912.7	341001	120.0103	11.079	5.4612	0.34
1913.85	341001	122.2485	11.1547	5.5064	0.316
1913.3	341001	125.17	12.0342	5.2816	0.324
1913	341001	121.6	11.261	5.3458	0.328
1914.35	341001	119.11	10.377	5.5834	0.331
1914.8	341001	128.7384	10.763	5.2015	0.335
1915.5	341001	130.04	11.457	4.6838	0.29
1915.85	341001	127.5185	10.9807	4.4507	0.298
1915.15	341001	132.5997	11.3291	5.0168	0.331
1916.75	341001	123.9994	8.3148	3.9197	0.275
1916.45	341001	121.1206	9.1486	4.1248	0.282
1917.45	341001	114.19	6.5613	3.3035	0.268
1917.1	341001	116.77	7.5215	3.6976	0.289
1918.5	341001	124.1301	4.9049	3.2116	0.291
1919.45	341001	124.66	5.1609	3.5142	0.326
1920.55	341001	125.3383	5.9345	3.5431	0.276
1920.85	341001	122.36	5.817	3.4411	0.278
1920.15	341001	126.95	5.7443	3.5749	0.307

1921.7	341001	125.8704	4.8102	3.3576	0.321
1921.15	341001	124.3508	5.6442	3.2615	0.331
1922.3	341001	121.4386	3.8849	5.4149	0.249
1922	341001	126.05	4.2024	3.6467	0.333
1923.1	341001	87.5552	3.8139	3.0152	0.089
1923.7	341001	98.1304	3.4206	2.4189	0.281
1924	341001	108.44	2.9968	2.4994	0.216
1925.4	341001	116.17	2.9511	3.1784	0.241
1925.1	341001	116.5201	2.7036	3.5181	0.275
1926.1	341001	99.146	3.5358	3.9077	0.048
1926.45	341001	117.178	4.1694	2.7289	0.255
1926.75	341001	102.56	4.0307	2.4973	0.288
1927.85	341001	122.2984	2.887	3.4042	0.14
1927.05	341001	89.4784	3.6345	2.4974	0.166
1928.5	341001	109.1768	3.0644	3.2841	0.297
1928.8	341001	104.43	3.3822	3.7887	0.325
1929.5	341001	117	3.7621	3.312	0.082
1929.85	341001	96.7806	3.4783	2.4496	0.128
1930.75	341001	91.558	2.2832	2.0984	0.297
1931.95	341001	119.15	2.0454	2.2189	0.31
1931.6	341001	117.7003	1.9029	2.2629	0.317
1932.3	341001	125.74	2.1481	2.3582	0.267
1933	341001	123.0979	2.1572	2.2787	0.018
1934.25	341001	116.45	2.1285	3.4027	0.049
1935.9	341001	109.63	1.6115	1.8248	0.175
1935.5	341001	105.05	2.0699	1.7126	0.182
1935.1	341001	85.6594	2.1907	1.8302	0.196
1936.95	341001	110.8134	1.4935	1.9422	0.172
1938.35	341001	115.2263	1.6136	1.5183	0.072
1939.9	341001	105	1.2711	1.9795	0.071
1946.3	341001	87.5011	1.6865	1.729	0.066
2232.55	341001	104.7	1.4527	1.9084	0.218
2233.05	341001	104.95	1.4028	2.2256	0.209
2234.45	341001	99.384	2.2412	2.1486	0.12
2234.9	341001	78.5968	2.4822	1.9824	0.156
2236.4	341001	105.4399	1.4825	1.9794	0.21
2237.5	341001	104.9299	1.5264	1.9684	0.206
2237	341001	105.34	1.4962	1.9824	0.212
2238.95	341001	107.1197	1.6255	2.6008	0.215
2238.4	341001	106.29	1.6255	2.2641	0.221
2239.6	341001	100.37	1.6064	2.0883	0.15
2240.1	341001	94.4575	1.5912	2.0239	0.135
2240.6	341001	104.1626	1.5284	1.9569	0.204
2241.15	341001	105.8	1.4504	1.9107	0.206
2241.7	341001	105.6399	1.4184	1.9025	0.212
2242.1	341001	105.5701	1.3772	1.8674	0.226

1908.4	3410a11	126.9	0.4458	2.332	0.189
1908.7	3410a11	125.9977	0.3793	2.335	0.289
1909	3410a11	121.5	0.3496	2.33	0.301
1910.8	3410a11	110.1	0.4238	2.402	0.279
1911.7	3410a11	133.6	0.5302	2.419	0.035
1911.4	3410a11	109.8	0.4228	2.427	0.048
1913.3	3410a11	92.4957	0.3232	2.9601	0.039
1913.9	3410a11	95.8195	0.3427	2.4839	0.311
1914.8	3410a11	119.0006	0.3383	2.117	0.337
1914.5	3410a11	88.5146	0.4355	2.033	0.338
1914.2	3410a11	125.1	0.3891	2.097	0.344
1915.2	3410a11	127.0015	0.3559	2.164	0.335
1926.6	3410a11	133.1002	0.3481	1.962	0.209
1926.9	3410a11	134.5	0.3691	1.825	0.372
1927.5	3410a11	133.2	0.3618	1.931	0.352
1927.8	3410a11	129.7008	0.3857	2.013	0.37
1928.7	3410a11	128.1	0.3935	2.021	0.366
1930	3410a11	132.5	0.3735	2.007	0.351
1930.3	3410a11	132.3001	0.3544	2.015	0.369
1931.8	3410a11	134.6008	0.3642	2.013	0.284
1931.5	3410a11	134.8	0.3666	1.987	0.349
1931.2	3410a11	135.8005	0.3618	1.989	0.378
1932.85	3410a11	135.3	0.3623	2.046	0.371
1932.5	3410a11	135.7995	0.3623	1.995	0.383
1933.4	3410a11	132.3	0.3359	2.019	0.302
1933.7	3410a11	137.6005	0.4184	1.988	0.331
1934	3410a11	136	0.3916	1.998	0.323
1934.9	3410a11	115.7	0.3828	2.251	0.359
1934.6	3410a11	114.1024	0.3579	2.2279	0.37
1934.3	3410a11	131.7	0.3657	2.039	0.375
1935.8	3410a11	127.9997	0.3691	2.042	0.357
1936.4	3410a11	129.2006	0.3618	2.009	0.37
1936.7	3410a11	130.7	0.3613	2.001	0.37
1937.6	3410a11	131.5993	0.3852	1.98	0.296
1937	3410a11	131.7008	0.3588	1.989	0.339
1937.3	3410a11	133.7	0.3613	1.96	0.356
1938.9	3410a11	131.1	0.3886	2.027	0.332
1938.6	3410a11	131.6999	0.4106	1.999	0.34
1938	3410a11	131	0.4096	1.993	0.348
1938.3	3410a11	131.6	0.4223	1.99	0.364
1939.2	3410a11	130.1006	0.3554	2.013	0.369
1939.5	3410a11	130	0.4062	2.042	0.388
1940.8	3410a11	156.2	0.4155	1.509	0.255
1941.1	3410a11	136.6983	0.3422	1.3381	0.246
1941.7	3410a11	124.1809	0.3911	2.162	0.289
1941.4	3410a11	134.7	0.3173	1.676	0.32

1942.9	3410a11	124.9997	0.3544	2.089	0.267
1942.6	3410a11	117.7	0.3447	2.218	0.323
1942.3	3410a11	104.6997	0.35	2.177	0.332
1942	3410a11	105.5	0.3691	2.181	0.346
1943.7	3410a11	125.5985	0.3476	2.083	0.309
1943.2	3410a11	123.7	0.3466	2.078	0.352
1943.4	3410a11	135.6	0.3471	2.085	0.356
1944	3410a11	126.1	0.3515	2.041	0.348
1944.8	3410a11	125.5	0.333	2.007	0.357
1945.7	3410a11	124.1007	0.3613	2.033	0.29
1945.1	3410a11	125.5987	0.3486	2.017	0.336
1945.8	3410a11	124.9996	0.3471	2.042	0.347
1945.4	3410a11	124.6	0.3852	2.027	0.355
1946.3	3410a11	120.6996	0.4331	2.078	0.243
1946	3410a11	123.8	0.3876	2.044	0.262
1946.6	3410a11	121.3	0.4335	2.095	0.32
1946.9	3410a11	129.0004	0.4282	2.048	0.341
1947.2	3410a11	130.1	0.3657	2.066	0.247
1947.5	3410a11	130.4996	0.3999	2.121	0.315
1947.8	3410a11	126.8011	0.3745	2.156	0.315
1948.1	3410a11	123.6	0.392	2.162	0.299
1948.7	3410a11	126.9	0.3803	2.05	0.333
1948.4	3410a11	126.6989	0.3618	2.097	0.335
1949.3	3410a11	124.8	0.3627	2.087	0.34
1949	3410a11	126.7984	0.3803	2.078	0.343
1950.1	3410a11	124.5	0.3188	2.097	0.249
1950.4	3410a11	123.0003	0.3583	2.074	0.271
1950.7	3410a11	123.6	0.3564	2.097	0.284
1951.6	3410a11	118.8015	0.3505	2.15	0.328
1951	3410a11	124.2952	0.3754	2.078	0.367
1951.3	3410a11	117.3	0.3569	2.144	0.383
1952.2	3410a11	125.8005	0.4448	2.039	0.059
1952.5	3410a11	126.3	0.4521	2.009	0.224
1952.8	3410a11	125.2002	0.4091	2.054	0.248
1953.7	3410a11	111.7922	0.7221	2.5349	0.306
1954	3410a11	144.1	0.5302	2.214	0.005
1954.9	3410a11	144.4987	0.3022	1.3211	0.305
1954.6	3410a11	168.8	0.3559	1.42	0.324
1955.5	3410a11	127.1981	0.3027	2.2301	0.332
1955.2	3410a11	131.5	0.3027	1.605	0.336
1955.8	3410a11	126.5983	0.31	2.2361	0.34
1956.1	3410a11	121.6	0.2983	2.052	0.344
1956.7	3410a11	119.7	0.3505	2.076	0.348
1956.4	3410a11	116.2006	0.3051	2.062	0.356
1957	3410a11	115.6004	0.35	2.056	0.349
1957.6	3410a11	117.3002	0.3383	2.035	0.349

1957.3	3410a11	116.2	0.33	2.037	0.355
1958.6	3410a11	121.6	0.3344	2.025	0.361
1958	3410a11	119	0.3203	2.029	0.362
1959.4	3410a11	128.1005	0.3178	1.991	0.344
1959	3410a11	122.8016	0.3168	2.021	0.372
1960	3410a11	128	0.3037	2.003	0.356
1960.6	3410a11	125.2	0.3403	2.044	0.356
1960.9	3410a11	126.2003	0.3369	2.035	0.372
1962.1	3410a11	128.2995	0.3559	2.009	0.365
1963.95	3410a11	126.6	0.3198	2.031	0.357
1964.3	3410a11	127.0996	0.3217	2.029	0.351
1964.6	3410a11	126.5	0.3442	2.013	0.363
1964.9	3410a11	126.7999	0.3364	2.011	0.364
1965.5	3410a11	126.3003	0.3115	2.025	0.362
1965.2	3410a11	127	0.3398	2.025	0.363
1967.7	3410a11	127.5996	0.497	2.253	0.21
1967.4	3410a11	127.7	0.5034	2.205	0.217
1968.4	3410a11	120.3	0.475	2.33	0.013
1968.05	3410a11	123.4995	0.476	2.273	0.203
1968.7	3410a11	107.8001	0.4296	2.427	0.307
1969.4	3410a11	124.8	0.4863	2.248	0.186
1969.7	3410a11	123.4	0.4946	2.308	0.187
1970.3	3410a11	122.5926	0.4936	2.318	0.18
1970	3410a11	122.9998	0.477	2.328	0.183
1970.6	3410a11	111.6	0.4799	2.351	0.226
1971.3	3410a11	130.6	0.4584	2.24	0.19
1972.9	3410a11	140.2	0.3779	1.997	0.363
1973.7	3410a11	131.1	0.3891	2.064	0.319
1973.45	3410a11	133.0992	0.3847	2.023	0.339
1973.2	3410a11	136	0.3891	2.005	0.354
1974.3	3410a11	129.3	0.4697	2.107	0.284
1974	3410a11	129.5001	0.3984	2.085	0.298
1974.6	3410a11	128.1997	0.4785	2.113	0.319
1975.7	3410a11	123.6	0.3872	2.166	0.274
1975.8	3410a11	124	0.4287	2.16	0.307
1975.5	3410a11	125.1015	0.3452	2.111	0.311
1975.2	3410a11	129.2	0.3579	2.029	0.364
1976.3	3410a11	130	0.3696	2.039	0.313
1976.6	3410a11	129.4998	0.3881	2.033	0.32
1976	3410a11	126.7008	0.4165	2.117	0.34
1976.9	3410a11	127.2007	0.4282	2.087	0.345
1977.5	3410a11	124.3004	0.3886	2.119	0.308
1977.8	3410a11	124.3	0.4169	2.111	0.332
1977.2	3410a11	126	0.3994	2.105	0.34
1978.4	3410a11	125.8	0.4091	2.14	0.275
1978.05	3410a11	124.0008	0.4301	2.097	0.302

1979.7	3410a11	124.1	0.4199	2.201	0.218
1979.4	3410a11	122.1005	0.4624	2.203	0.255
1979.15	3410a11	123.6	0.4599	2.218	0.275
1980	3410a11	120.2992	0.4287	2.302	0.183
1980.8	3410a11	116.1995	0.4111	2.285	0.202
1981.1	3410a11	116.8	0.4345	2.285	0.179
1981.7	3410a11	118	0.4384	2.33	0.241
1981.4	3410a11	121.3015	0.4843	2.267	0.243
1982.6	3410a11	130.1	0.4814	2.238	0.176
1982.9	3410a11	130.9997	0.5263	2.207	0.181
1982	3410a11	104.8011	0.3862	2.451	0.185
1982.3	3410a11	113.2	0.4707	2.302	0.186
1983.8	3410a11	124	0.3876	2.144	0.243
1983.2	3410a11	135.5	0.6015	1.969	0.268
1983.45	3410a11	132.2016	0.4731	1.965	0.324
1984.35	3410a11	116.6	0.3881	2.205	0.228
1984.1	3410a11	119.2985	0.4062	2.205	0.242
1984.8	3410a11	112.0999	0.4106	2.253	0.242
1984.7	3410a11	112.0001	0.4111	2.271	0.253
1985.6	3410a11	107.1	0.4536	2.179	0.17
1985	3410a11	110.5	0.4096	2.242	0.212
1985.9	3410a11	122.5027	0.3964	2.076	0.245
1985.35	3410a11	108.0978	0.4189	2.244	0.31
1985.8	3410a11	115.6	0.4252	2.126	0.315
1985.6	3410a11	107.1	0.4536	2.179	0.363
1986.1	3410a11	127.5001	0.4199	2.066	0.242
1986.7	3410a11	121.5989	0.3911	2.128	0.261
1986.3	3410a11	127.6	0.4282	2.076	0.314
1986.35	3410a11	125.1	0.4301	2.111	0.34
1987.7	3410a11	121	0.4077	2.187	0.049
1987.4	3410a11	123.2984	0.4477	2.166	0.202
1987.1	3410a11	122.6	0.3837	2.164	0.309
1988	3410a11	112.5934	0.3535	2.208	0.191
1988.6	3410a11	109.0069	0.4013	2.236	0.193
1988.3	3410a11	102.5	0.3256	2.302	0.222
1989.3	3410a11	120.3015	0.4135	2.199	0.194
1989.9	3410a11	131.7021	0.4931	2.236	0.209
1989	3410a11	120.3	0.3745	2.173	0.222
1989.6	3410a11	125	0.4433	2.197	0.258
1990.5	3410a11	121.699	0.4775	2.353	0.187
1990.8	3410a11	119.7997	0.4755	2.318	0.188
1990.2	3410a11	129.1	0.5058	2.289	0.21
1991.7	3410a11	121.4	0.4628	2.257	0.169
1991.4	3410a11	117.3018	0.4775	2.337	0.179
1991.1	3410a11	116.5	0.4746	2.328	0.185
1993.6	3410a11	122.9	0.4648	2.306	0.326

1993.3	3410a11	120.2999	0.4272	2.304	0.367
1993.9	3410a11	124.5017	0.4541	2.31	0.37
1995.6	3410a11	138.1	0.4042	1.949	0.355
1995.3	3410a11	142.6954	0.5086	1.8201	0.357
1995	3410a11	150.5	0.6679	1.404	0.372
1995.95	3410a11	137.0005	0.3793	1.995	0.384
1996.5	3410a11	135.2	0.3916	1.97	0.328
1996.2	3410a11	137.6	0.394	1.986	0.335
1999.8	3410a11	102.5034	0.3544	2.302	0.248
1999.5	3410a11	98.5	0.35	2.32	0.264
1999.25	3410a11	105.7971	0.3349	2.238	0.288
2000.4	3410a11	129.1	0.4228	2.076	0.308
2000.7	3410a11	127.2008	0.4155	2.099	0.315
2000.1	3410a11	118.3	0.4077	2.167	0.336
2001.9	3410a11	124.799	0.4497	2.253	0.227
2001.3	3410a11	124.5996	0.416	2.205	0.243
2001.6	3410a11	123	0.4267	2.236	0.256
2002.5	3410a11	119.7979	0.4692	2.248	0.189
2002.2	3410a11	122.3	0.4433	2.265	0.21
2002.8	3410a11	117.8	0.476	2.279	0.293
2003.4	3410a11	120.5	0.4067	2.216	0.214
2003.1	3410a11	118.701	0.435	2.255	0.22
2003.7	3410a11	117.699	0.4033	2.236	0.247
2004.3	3410a11	120.1	0.4135	2.298	0.095
2004.6	3410a11	124.5991	0.458	2.228	0.186
2004.9	3410a11	124.9	0.4765	2.222	0.195
2004	3410a11	115.7	0.3862	2.33	0.236
2005.5	3410a11	114.6	0.4609	2.332	0.199
2005.2	3410a11	123.5937	0.4877	2.214	0.2
2005.8	3410a11	129.0078	0.5805	2.0799	0.2
2007	3410a11	123.8	0.3852	2.187	0.174
2007.6	3410a11	106.8	0.3413	2.257	0.227
2007.3	3410a11	113.9952	0.3603	2.24	0.24
2007.9	3410a11	111.3066	0.3886	2.248	0.242
2008.2	3410a11	124.1	0.4541	2.195	0.141
2008.8	3410a11	134.1	0.5673	2.093	0.158
2008.5	3410a11	125.0015	0.4023	2.236	0.173
2009.4	3410a11	127.3	0.4658	1.973	0.199
2009.7	3410a11	124.8002	0.4428	2.125	0.259
2010.1	3410a11	124.5	0.3666	2.068	0.187
2011.5	3410a11	122	0.3413	2.093	0.33
2011.8	3410a11	124.0009	0.3881	2.095	0.335
2011.2	3410a11	121.0986	0.3461	2.062	0.341
2012.4	3410a11	125.9986	0.4174	2.123	0.302
2012.7	3410a11	117.8	0.3881	2.171	0.324
2013.9	3410a11	135.1985	0.4951	1.9421	0.174

2013.6	3410a11	125.5028	0.4296	2.2419	0.216
2013.3	3410a11	114.6	0.4106	2.347	0.218
2013	3410a11	114.0003	0.35	2.291	0.291
2014.2	3410a11	141.7	0.5585	1.854	0.261
2015.1	3410a11	115.3998	0.3876	2.255	0.202
2015.4	3410a11	115.2	0.4189	2.314	0.214
2015.7	3410a11	117.1	0.4047	2.271	0.226
2016	3410a11	117.1	0.372	2.271	0.225
2016.6	3410a11	120.9996	0.4174	2.222	0.234
2016.3	3410a11	118.8	0.4135	2.265	0.253
2016.9	3410a11	121.8	0.4213	2.201	0.314
2017.2	3410a11	123.6983	0.4472	2.21	0.209
2017.8	3410a11	101.7973	0.3149	2.294	0.268
2018.4	3410a11	112.3041	0.3754	2.13	0.174
2018.7	3410a11	124.8	0.4111	2.052	0.29
2018.1	3410a11	101.3	0.3535	2.25	0.302
2019	3410a11	125.6969	0.3759	2.007	0.3
2019.6	3410a11	101.3015	0.333	2.287	0.37
2019.3	3410a11	114.4	0.3398	2.14	0.386
2020.2	3410a11	127.7	0.3906	2.115	0.226
2020.5	3410a11	127.5983	0.3999	2.117	0.319
2020.8	3410a11	124.6	0.4042	2.216	0.364
2021.4	3410a11	121.5	0.4086	2.216	0.278
2021.7	3410a11	125.5068	0.3837	2.1849	0.296
2021.1	3410a11	120.501	0.4409	2.261	0.343
2022.3	3410a11	139.2951	0.558	1.718	0.256
2022	3410a11	136.7	0.5224	1.956	0.331
2023.3	3410a11	146.6	0.5961	1.767	0.176
2023	3410a11	138.5039	0.54	2.0639	0.187
2023.9	3410a11	153.6012	0.5312	1.907	0.214
2024.2	3410a11	151.1	0.5869	1.674	0.189
2025.4	3410a11	127.7	0.4057	2.22	0.136
2025.7	3410a11	143.2015	0.5297	1.7449	0.155
2026	3410a11	145.5	0.5356	1.706	0.147
2029.1	3410a11	149.1998	0.5361	1.7831	0.204
2031.9	3410a11	125.7	0.4614	2.187	0.251
2031.6	3410a11	122.6012	0.4121	2.218	0.326
2032.25	3410a11	124.5006	0.3852	2.07	0.176
2032.5	3410a11	126.1	0.3735	2.037	0.211
2032.8	3410a11	128.0987	0.2832	1.987	0.372
2033.7	3410a11	116.4996	0.3564	2.365	0.266
2033.1	3410a11	124	0.3139	2.136	0.348
2033.4	3410a11	117.4	0.3408	2.33	0.389
2034	3410a11	117.1	0.4077	2.384	0.201
2034.3	3410a11	120.0013	0.4111	2.283	0.224
2034.6	3410a11	125.6	0.3378	2.201	0.229

2034.9	3410a11	130.2028	0.4063	2.23	0.281
2035.2	3410a11	140.7	0.5605	2.041	0.205
2037	3410a11	124.7988	0.3066	2.101	0.163
2037.3	3410a11	124.9	0.3251	2.082	0.324
2037.8	3410a11	124.6997	0.3291	2.05	0.339
2038.4	3410a11	124.6002	0.333	2.023	0.327
2038.1	3410a11	124.2	0.3413	2.029	0.336
2038.7	3410a11	125	0.3178	2.033	0.339
2039	3410a11	124.5997	0.3125	2.039	0.332
2039.6	3410a11	122.2995	0.3085	2.06	0.339
2039.9	3410a11	122	0.3134	2.054	0.343
2040.2	3410a11	122.1994	0.3061	2.046	0.325
2040.7	3410a11	120.5	0.2988	2.056	0.34
2041.6	3410a11	119.0004	0.2934	2.082	0.321
2041.9	3410a11	121.3	0.3208	2.064	0.325
2041.3	3410a11	118.6	0.29	2.08	0.339
2041	3410a11	120.9994	0.3027	2.052	0.341
2042.9	3410a11	125.3995	0.3227	2.056	0.329
2042.2	3410a11	122.3004	0.3291	2.046	0.349
2042.65	3410a11	124.3	0.3374	2.052	0.352
2043.2	3410a11	124.4	0.3168	2.058	0.33
2043.8	3410a11	124.8	0.3173	2.046	0.361
2044.4	3410a11	121.5	0.3256	2.048	0.344
2044.1	3410a11	122.5996	0.3051	2.066	0.356
2045.7	3410a11	120.7994	0.2915	2.021	0.355
2045	3410a11	120.0008	0.3217	2.031	0.356
2046	3410a11	122.2	0.3466	2.017	0.34
3543.5	3410c14	117.2038	9.5576	18.46	0.23
3543.3	3410c14	117.1001	10.0334	16.0221	0.251
3543.85	3410c14	116.6006	10.8628	24.6164	0.251
3543	3410c14	118.5	10.7039	17.2299	0.258
3544.25	3410c14	112.2	12.195	26.481	0.185
3544.6	3410c14	116.3031	11.1687	18.8696	0.255
3544.95	3410c14	120.7975	13.4686	25.2987	0.275
3545.3	3410c14	121.5	12.34	30.481	0.277
3545.6	3410c14	120.7986	12.956	22.8812	0.28
3546.65	3410c14	107.2	12.071	12.445	0.185
3546.8	3410c14	105.2	9.294	11.633	0.185
3546.1	3410c14	114.5951	11.4207	23.4236	0.235
3549.15	3410c14	108.1031	2.51	2.6549	0.15
3550.05	3410c14	94.8028	3.2249	3.4047	0.098
3550.3	3410c14	97.5991	3.0571	3.916	0.159
3562.85	3410c14	123.4996	1.592	1.605	0.144
3562.3	3410c14	126.1997	1.727	1.7651	0.195
3562	3410c14	125.5005	1.8589	1.9159	0.197
3563.15	3410c14	121.1031	1.502	1.5009	0.129

3576.6	3410c14	64.8167	2.6094	2.6211	0.111
3576.95	3410c14	79.2972	2.891	2.7809	0.192
3577.9	3410c14	85.0139	3.3271	3.2159	0.168
3577.6	3410c14	90.0959	3.1242	3.309	0.178
3577.2	3410c14	91.9	3.063	2.868	0.213
3578.6	3410c14	120.1006	4.9042	5.2067	0.198
3578.85	3410c14	121.5991	5.4819	7.0063	0.231
3578.2	3410c14	109.2885	3.4419	3.3988	0.28
3579.95	3410c14	121.3	13.788	23.433	0.249
3579	3410c14	120.3999	6.6398	8.6912	0.281
3579.65	3410c14	116.4	14.324	26.303	0.283
3580.25	3410c14	127.5016	16.1638	25.9893	0.275
3580.35	3410c14	129.2956	16.0304	29.6765	0.275
3581.15	3410c14	124.4	1950	75.91	0.259
3582.2	3410c14	109.7019	1950	1950	0.26
3582.6	3410c14	109.2	82.21	1950	0.278
3583.6	3410c14	110.3992	28.2572	1950	0.167
3583.9	3410c14	110.9	15.61	1950	0.231
3583.05	3410c14	107.5995	139.8607	1950	0.268
3584.2	3410c14	111.2004	15.368	155.7919	0.215
3584.95	3410c14	107.6005	8.9841	13.378	0.227
3584.55	3410c14	110.1968	10.3257	18.7882	0.228
3585.2	3410c14	107.8	10.066	24.64	0.217
3585.45	3410c14	110.7014	13.5677	33.3694	0.254
3585.95	3410c14	115.4952	19.761	35.077	0.273
3586.8	3410c14	107.6972	15.7068	1948.645	0.25
3586.6	3410c14	109.5	22.051	1950	0.264
3587.2	3410c14	100.5024	10.6259	24.3456	0.191
3587.4	3410c14	101.7987	10.587	11.1979	0.253
3587.6	3410c14	104.3	6.371	7.667	0.254
3589.2	3410c14	95.7	2.38	2.629	0.173
3596.6	3410c14	96.399	1.9139	2.3604	0.134
3596.2	3410c14	97.2983	1.8639	2.0531	0.144
3596.9	3410c14	102.1	2.296	2.489	0.17
3597.2	3410c14	101.1017	2.6701	2.822	0.164
3597.45	3410c14	104.0014	2.9051	2.8235	0.228
3597.7	3410c14	103.2057	3.5452	4.0093	0.228
3597.9	3410c14	106.6031	4.2653	4.776	0.246
3598.7	3410c14	117.9005	8.0991	9.7081	0.235
3598.9	3410c14	118.4006	8.1937	15.4457	0.264
3599.9	3410c14	113.9005	9.0011	14.9681	0.247
3599.6	3410c14	118	8.588	15.728	0.262
3599.2	3410c14	119.5992	7.3959	15.5979	0.263
3600.2	3410c14	117.4007	9.3982	10.9381	0.263
3600.6	3410c14	117.9005	9.3441	12.541	0.275
3600.9	3410c14	117.9	10.264	12.065	0.277

3601.9	3410c14	115.5025	15.6629	20.4849	0.234
3601.65	3410c14	121.096	12.7975	17.7353	0.268
3601.2	3410c14	120.3011	11.4214	14.4127	0.29
3602.9	3410c14	117.0954	20.6747	25.6106	0.255
3602.2	3410c14	111.5017	14.5635	21.4276	0.278
3602.6	3410c14	116.1012	17.3027	22.5714	0.286
3603.9	3410c14	117.9004	30.5548	59.3249	0.249
3603.2	3410c14	113.4005	24.9038	25.9902	0.251
3603.6	3410c14	118.3	29.132	40.014	0.284
3604.2	3410c14	119.3026	37.2811	82.6927	0.276
3604.65	3410c14	120.7002	44.9202	129.754	0.283
3604.85	3410c14	120.8	45.118	400.5227	0.302
3605.3	3410c14	118.2997	50.1384	291.9781	0.272
3605.05	3410c14	119.7	46.837	133.141	0.283
3605.95	3410c14	121.1985	43.246	216.2666	0.292
3606.95	3410c14	113.8979	48.233	63.1019	0.273
3606.7	3410c14	116.4983	46.1004	83.2025	0.275
3607.25	3410c14	109.3023	25.1915	50.9869	0.287
3607.7	3410c14	114.701	22.8604	20.0372	0.325
3608	3410c14	116.7006	22.0067	26.1126	0.274
3608.3	3410c14	116.9981	23.1675	43.8853	0.28
3609.3	3410c14	117.5041	25.3396	65.5408	0.284
3609	3410c14	112.9	35.723	1950	0.289
3609.7	3410c14	120.9968	24.5165	35.595	0.298
3610	3410c14	118.9002	27.0306	62.8402	0.281
3610.3	3410c14	119.3	27.524	32.894	0.281
3610.7	3410c14	118.8996	26.3921	29.3399	0.293
3611.7	3410c14	108.6998	32.5576	25.4038	0.285
3611	3410c14	117.2998	25.8891	28.1214	0.297
3612.05	3410c14	112.0049	20.8098	17.2813	0.226
3612.7	3410c14	122.5009	15.3187	22.894	0.285
3612.3	3410c14	122.4032	19.1682	15.1891	0.286
3613	3410c14	120.5	20.413	32.732	0.282
3613.2	3410c14	121.3011	28.1032	58.6559	0.283
3613.6	3410c14	122.101	25.1512	64.7616	0.288
3614.7	3410c14	123.1	35.5388	41.7388	0.285
3614	3410c14	123.1999	29.7102	45.9495	0.295
3614.3	3410c14	122.9	30.842	74.242	0.305
3615	3410c14	123.1003	28.1416	39.4315	0.281
3615.3	3410c14	123.3999	27.0252	37.783	0.282
3615.7	3410c14	122.5	26.053	43.333	0.295
3615.95	3410c14	122.7012	28.4705	32.71	0.311
3616.85	3410c14	119.2	26.557	31.321	0.295
3616.3	3410c14	124.1985	23.9143	29.1888	0.305
3617.7	3410c14	122.3992	21.6436	21.5626	0.268
3617.3	3410c14	120.0011	22.6661	25.9656	0.278

3617	3410c14	118.8003	23.9056	33.075	0.301
3618.3	3410c14	120.1	19.629	20.237	0.263
3618	3410c14	121.2004	19.5849	23.2373	0.276
3618.7	3410c14	120.9004	16.4334	20.4028	0.288
3619.3	3410c14	118.7	21.203	15.558	0.277
3619.7	3410c14	117.2	15.588	12.343	0.279
3619	3410c14	120.699	20.0073	17.1413	0.29
3620	3410c14	116.9998	16.1276	12.6507	0.274
3620.3	3410c14	117.6064	13.5822	14.6853	0.275
3621.3	3410c14	118.5917	29.3344	32.8615	0.277
3621.55	3410c14	111.7928	28.8835	49.5915	0.278
3623	3410c14	120.0087	10.071	8.6676	0.247
3623.7	3410c14	119.0004	18.7537	19.2338	0.276
3623.3	3410c14	125.4	9.261	9.947	0.299
3624.3	3410c14	124.3025	16.4121	20.7211	0.253
3624.7	3410c14	129.6	17.221	24.634	0.265
3624.05	3410c14	121.9035	17.1669	20.3016	0.312
3625.7	3410c14	124.7001	23.2561	25.7021	0.284
3625	3410c14	129.399	18.1275	27.4984	0.292
3626.7	3410c14	124.4003	33.1753	27.7415	0.275
3626.95	3410c14	124.5994	40.2145	37.7329	0.292
3626	3410c14	124.9	30.33	25.853	0.297
3627.3	3410c14	124.3	40.714	46.6739	0.26
3627.7	3410c14	124.1003	34.0272	84.128	0.293
3628.3	3410c14	123.5996	33.2889	164.8763	0.267
3628	3410c14	124.3983	34.5999	168.318	0.281
3629.7	3410c14	123.1008	26.7531	46.6688	0.229
3629.3	3410c14	126.8975	31.0821	63.3371	0.279
3629.05	3410c14	124.1023	31.3098	73.5016	0.3
3630.7	3410c14	119.7938	28.3112	22.8619	0.268
3630	3410c14	122	26.278	33.421	0.291
3636.7	3410c14	70.8	17.333	40.882	0.113
3636.45	3410c14	76.011	18.0853	37.9157	0.164
3636.1	3410c14	102.5813	15.5996	35.1398	0.268
3637.1	3410c14	82.1086	17.4086	39.2673	0.148
3637.45	3410c14	109.3992	15.3413	30.3445	0.275
3638.7	3410c14	108.2007	16.7165	14.1794	0.2
3638.35	3410c14	109.6987	19.4422	14.1815	0.219
3638.1	3410c14	103.2	15.727	16.569	0.237
3639.7	3410c14	106.2999	2.9635	2.7717	0.117
3639.1	3410c14	106.1003	5.2389	5.2211	0.124
3639.4	3410c14	103.7	4.111	3.166	0.126
3640.85	3410c14	106.2009	1.725	1.714	0.113
3640.75	3410c14	106.6	1.8	1.759	0.124
3640	3410c14	106.4026	2.1547	2.1276	0.126
3643.4	3410c14	103.3	1.478	1.617	0.109

3643.1	3410c14	101.6018	1.527	1.719	0.113
3649.1	3410c14	99.4019	1.823	2.1549	0.151
3649.4	3410c14	101.1085	1.826	2.0309	0.183
3649.7	3410c14	108.998	1.787	1.952	0.275
3650.65	3410c14	116.3075	1.526	1.6609	0.278
3650.4	3410c14	112.0053	1.543	1.686	0.282
3651.7	3410c14	104.3923	1.581	1.711	0.173
3651.4	3410c14	124.7	1.554	1.669	0.304
3651.1	3410c14	129.7985	1.533	1.649	0.316
3652.1	3410c14	102.409	1.537	1.6999	0.184
3652.4	3410c14	105.7	1.497	1.591	0.206
3652.7	3410c14	104.3	1.452	1.485	0.237
3653.1	3410c14	101.1009	1.358	1.424	0.156
3653.7	3410c14	108.2972	1.301	1.397	0.208
3653.4	3410c14	102.2031	1.313	1.397	0.289
3654.7	3410c14	106.3035	1.344	1.404	0.172
3654.4	3410c14	106.8996	1.317	1.382	0.2
3654.1	3410c14	108.7996	1.287	1.381	0.212
3655.7	3410c14	86.7063	1.385	1.4371	0.129
3655.5	3410c14	88.9972	1.368	1.429	0.219
3655.1	3410c14	107.1	1.365	1.418	0.302
3656.4	3410c14	100.1	1.523	1.651	0.117
3656.7	3410c14	100.6	1.582	1.696	0.131
3656.05	3410c14	98.7072	1.4681	1.5641	0.15
3657.1	3410c14	99.4006	1.673	1.803	0.157
3657.4	3410c14	100.5992	1.694	1.844	0.162
3658.1	3410c14	104.4991	1.714	1.824	0.228
3662.7	3410c14	104.0933	1.656	1.7771	0.161
3662.1	3410c14	98.5009	1.625	1.739	0.191
3662.4	3410c14	99.6026	1.616	1.734	0.193
3663.4	3410c14	106.4987	1.636	1.753	0.142
3663.7	3410c14	100.4	1.632	1.677	0.148
3663.1	3410c14	102.7	1.652	1.863	0.151
3664.1	3410c14	101.5992	1.592	1.692	0.158
3664.4	3410c14	104.9	1.578	1.73	0.186
3664.7	3410c14	107.501	1.575	1.701	0.202
3665.2	3410c14	111.2971	1.534	1.593	0.148
3665.4	3410c14	109.7017	1.527	1.568	0.174
3665.7	3410c14	108.2	1.504	1.594	0.205
3666.95	3410c14	121.1	1.316	1.355	0.248
3666.05	3410c14	112.5	1.458	1.551	0.265
3666.4	3410c14	115.2049	1.4079	1.4779	0.285
3666.65	3410c14	118.4053	1.3709	1.4279	0.298
3667.15	3410c14	119	1.247	1.302	0.267
3667.7	3410c14	119.8013	1.179	1.213	0.281
3668.95	3410c14	112.6957	1.222	1.332	0.192

3668.4	3410c14	122	1.167	1.222	0.284
3668.1	3410c14	123.1994	1.147	1.199	0.299
3669.7	3410c14	116.9	1.368	1.435	0.267
3669.9	3410c14	114.1999	1.44	1.605	0.274
3670.7	3410c14	115.1014	1.434	1.574	0.239
3670.5	3410c14	116.5972	1.435	1.595	0.283
3671.35	3410c14	105.1021	1.251	1.462	0.053
3671.55	3410c14	108.106	1.149	1.2869	0.221
3671.1	3410c14	106.1	1.332	1.495	0.285
3672.1	3410c14	129.3921	1.098	1.201	0.278
3672.7	3410c14	116.6996	1.077	1.222	0.278
3673.4	3410c14	108.2009	1.1	1.241	0.184
3673.1	3410c14	112.9938	1.112	1.251	0.231
3673.7	3410c14	110.6	1.053	1.171	0.259
3674.7	3410c14	107.0059	0.999	1.09	0.139
3674.4	3410c14	115.4965	0.984	1.054	0.225
3674.1	3410c14	120.5998	1.005	1.101	0.273
3675.7	3410c14	118.4896	0.952	0.995	0.294
3675.1	3410c14	110.3	0.945	1.092	0.297
3675.35	3410c14	115.6015	0.944	1.04	0.313
3676.1	3410c14	113.7986	0.904	0.987	0.256
3676.7	3410c14	112.197	1.105	1.1281	0.278
3676.4	3410c14	116	0.943	1.017	0.284
3677.1	3410c14	89.9831	1.3471	1.5103	0.048
3677.4	3410c14	79.4006	1.5009	1.7539	0.134
3677.7	3410c14	98.4	1.629	1.819	0.27
3678.5	3410c14	109.0028	1.636	1.724	0.262
3678.2	3410c14	108.8984	1.69	1.764	0.266
3679.05	3410c14	101.5	1.568	1.727	0.132
3679.4	3410c14	85.3981	1.568	1.688	0.148
3683.4	3410c14	85.5006	1.64	1.8371	0.064
3683.05	3410c14	100.1	1.557	1.623	0.131
3684.2	3410c14	109.8	1.718	1.799	0.139
3684.7	3410c14	99.3141	1.5429	1.7109	0.161
3684.4	3410c14	104.8	1.706	1.77	0.17
3686.1	3410c14	111.0964	1.4141	1.5532	0.104
3686.7	3410c14	97.3008	1.7949	1.99	0.125
3686.4	3410c14	102.393	1.5792	1.8341	0.137
3687.4	3410c14	98.2943	1.929	2.058	0.125
3687.7	3410c14	94.0006	1.919	2.044	0.141
3687.1	3410c14	97.1009	1.952	2.095	0.186
3689.3	3410c14	75.3084	2.419	2.7799	0.21
3689.7	3410c14	87.3	2.425	2.29	0.216
3690.1	3410c14	104.4962	2.4639	2.271	0.207
3690.4	3410c14	101.7058	2.2427	2.3039	0.239
3690.7	3410c14	104.1005	1.9891	2.1481	0.247

3691.4	3410c14	96.9999	1.7699	1.751	0.157
3691.7	3410c14	97.6069	1.713	1.7261	0.181
3691.05	3410c14	105.5	1.932	1.942	0.209
3692.4	3410c14	104.8	1.631	1.72	0.135
3692.1	3410c14	102.999	1.681	1.772	0.161
3695.65	3410c14	104.1987	1.58	1.601	0.121
3695.25	3410c14	111.6974	1.504	1.536	0.129
3696.15	3410c14	108	1.62	1.611	0.127
3696.95	3410c14	107.1983	1.6871	1.6361	0.128
3696.7	3410c14	108.8978	1.654	1.5921	0.148
3696.45	3410c14	113.5999	1.624	1.597	0.187
3811.8	3410c14	124.7031	5.8522	6.1073	0.278
3812.7	3410c14	125.1	6.582	7.96	0.291
3812.1	3410c14	127.9016	6.2532	6.6577	0.318
3812.95	3410c14	126.8016	6.507	7.7099	0.32
3813.65	3410c14	129.3007	6.175	8.191	0.322
3813.9	3410c14	128.8	5.962	7.865	0.323
3813.3	3410c14	130.6993	6.196	7.9883	0.325
3814.85	3410c14	116.2054	4.912	5.8593	0.309
3814.55	3410c14	123.0978	5.1717	6.5145	0.319
3815.95	3410c14	101.8066	3.8858	3.4482	0.275
3815.25	3410c14	98.5	4.856	5.324	0.309
3815.55	3410c14	77.6005	4.6329	4.5698	0.329
3815.7	3410c14	78.8138	4.3538	4.2506	0.329
3816.9	3410c14	127.3952	1.9967	1.5738	0.324
3816.65	3410c14	116.8	2.591	1.848	0.329
3816.3	3410c14	112.3943	3.5892	2.7292	0.332
3817.65	3410c14	117.1999	0.8401	0.681	0.311
3817.1	3410c14	117.7985	1.2327	1.0737	0.325
3817.9	3410c14	117.4	0.676	0.633	0.337
3818.7	3410c14	116.6973	0.486	0.508	0.324
3818.25	3410c14	117.7003	0.532	0.564	0.33
3819.4	3410c14	116.9001	0.436	0.477	0.319
3819.95	3410c14	117.6994	0.446	0.494	0.321
3819.2	3410c14	115	0.444	0.5	0.333
3819.65	3410c14	117.0996	0.435	0.478	0.338
3820.5	3410c14	114.7	0.453	0.511	0.33
3820.7	3410c14	114.6	0.455	0.503	0.334
3821	3410c14	116.3007	0.475	0.5	0.324
3821.4	3410c14	118.6004	0.451	0.494	0.34
3821.95	3410c14	119.2	0.444	0.479	0.35
3822.5	3410c14	117.3988	0.424	0.465	0.331
3822.2	3410c14	118.8002	0.439	0.473	0.338
3822.8	3410c14	116.3003	0.424	0.459	0.346
3823.5	3410c14	115.0992	0.44	0.488	0.323
3823.2	3410c14	116.4	0.425	0.47	0.332

3824.7	3410c14	116.9	0.466	0.503	0.326
3824.05	3410c14	116.3017	0.457	0.499	0.328
3824.5	3410c14	117.4	0.468	0.505	0.335
3825.65	3410c14	118.1003	0.451	0.495	0.343
3825.2	3410c14	119.1993	0.448	0.498	0.351
3825.5	3410c14	118.8999	0.448	0.492	0.356
3826.7	3410c14	115.6009	0.503	0.552	0.318
3826.15	3410c14	118.2997	0.463	0.52	0.319
3826.5	3410c14	117.199	0.481	0.537	0.331
3827.95	3410c14	88.8805	0.7622	0.8172	0.273
3827.5	3410c14	105.4989	0.592	0.636	0.298
3827.65	3410c14	104.0941	0.6311	0.6771	0.301
3827.15	3410c14	110.9	0.544	0.581	0.308
3828.25	3410c14	79.2996	0.9549	1.0569	0.096
3854.6	3410c14	99.6994	1.734	1.798	0.081
3854.95	3410c14	90.6	1.802	1.896	0.099
3855.6	3410c14	93.6017	1.9341	2.0411	0.08
3855.3	3410c14	87.7015	1.861	1.974	0.148
3856.2	3410c14	92.2	2.132	2.299	0.113
3856.9	3410c14	89.6998	2.148	2.2659	0.156
3857.4	3410c14	87.0003	2.052	2.08	0.101
3857.2	3410c14	87.5019	2.095	2.1451	0.149
3879.95	3410c14	99.4005	1.95	1.906	0.144
3880.6	3410c14	70.0971	2.5082	2.8492	0.044
3880.9	3410c14	64.2009	2.8583	3.1782	0.059
3880.1	3410c14	90.5	2.058	2.055	0.166
3881.3	3410c14	84.6	2.806	3.136	0.179
3881.45	3410c14	87.5	2.65	2.851	0.19
3881.65	3410c14	93.6015	2.4899	2.5379	0.217